LETTER TO THE EDITOR

Tanning property of periodate oxidised alginic acid*

Alginic acid or algin is an organic acid which occurs in large quantities in many sea-weeds. It is a valuable sizing material and is used as an adjunct to starch because it fills the cloth better and is tougher and more elastic. It imparts a thick, clothy, elastic feeling to goods without the stiffness of starch. Ammoniated aluminium alginate becomes insoluble after drying and has been used for the preparation of waterproof fabrics.[1]

According to the recent investigations,[2] alginic acid molecule seems to be a linear polymer of D-mannuronic and L-guluronic acid residues linked together by 1,4-linkages, probably β and α respectively. An inspection of the formula for alginic acid showed that each monomeric unit of alginic acid possesses two adjacent hydroxyl groups on carbon 2 and 3 and this must be susceptible to oxidation by periodic acid. The resultant dialdehyde compound was expected to have tanning property. The tanning property of periodate oxidised starch was first demonstrated by Filachione and coworkers.[3,4] Alginic acid was therefore oxidised with periodic acid and the tanning potency of the dialdehyde alginic acid was tested.

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Experimental

Oxidation of alginic acid with periodic acid

The conditions adopted by Lucas and Stewart[5] were followed. 15 g. dried alginic acid (0·085 equiv.) was stirred vigorously with 425 ml. of 0·380 M periodic acid and the mixture stored at room temperature for 20-24 hours. The oxidised product was precipitated by adding tertiary butyl alcohol and the precipitate was collected by centrifugation and washed with aqueous tertiary butyl alcohol.

Since this method of preparation was very expensive owing to the high cost of solvents required for precipitations etc., the oxidation of alginic acid was attempted in other solvents in which the oxidised product will not peptise but will remain as an insoluble product. After trying different solvents, it was found that aqueous dioxane can be conveniently utilised for this purpose. Alginic acid was suspended in dioxane and the calculated amount of periodic acid dissolved in an equal volume of water was added and kept for 24 hours at room temperature. The product was then filtered and washed with aqueous dioxane.

In another set of experiments, alginic acid was oxidised with aqueous periodic acid and the reaction product was freed from salts by dialysis against water.

The tanning experiments were carried out as in the case of dialdehyde starch.

Results and discussion

The shrinkage temperature of pelts tanned with periodate oxidised alginic acid was found to be 75-77°C as in the case of dialdehyde starch. Since dialdehyde alginic acid possesses one carboxyl group on every monomer unit and forms insoluble complexes with aluminium and chromium, it was thought that its introduction in collagen will impart additional affinity to collagen for these metallic compounds. In separate experiments dialdehyde alginic acid tanned pelts were retanned with aluminium and chrome and the shrinkage temperature of these leathers was found to be 80° and 115°C respectively. The leathers produced also appeared to be fuller. These experiments however could be carried out only on small pelts in a laboratory scale; full tanning trials could not be carried out owing to the high cost of the material. Hence at the present stage, the tanning property of dialdehyde alginic acid is only of theoretical interest. It is however hoped that further developments in its preparation may offer promise of making this polyaldehyde commercially available.

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